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ABSTRACT

To give students more experience with real situations, many professional schools use case studies in their courses. Creating complex cases, case experiences that immerse students in complex problems, rather than mere case studies that require armchair analysis should help students gain better and more integrated knowledge. Designing, implementing, and learning from complex cases are examined; and an example of a complex case is described. Through complex cases, students should increase their experience with, and ability to see the interconnectedness of, concepts and examples. A professor at the School of Business at Indiana University developed the Automotive Armature (AA) case about a manufacturing company experiencing a variety of financial difficulties and operational problems. AA did not present information in a distilled and neatly organized manner but was designed to be highly authentic. Experiences of 250 students in and MBA (Master of Business Administration) program illustrate the usefulness of the complex case and the favorable reaction of students. Professors generally reacted favorably to the exercise, offering suggestions for improvement, especially in integrating recommendations. (Contains 18 references.) (SLD)

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Title:

Improving the Effectiveness of Professional Education: Learning Managerial Accounting via a Complex Case

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Professional Education and Case-Based Instruction

Educators in various disciplines such as medicine (e.g., Association of American Medical Colleges, 1984), teacher education (e.g. Shulman, 1986), business (e.g., Mason, 1992) and engineering (e.g., Albright & Albright, 1981) have expressed increased dissatisfaction with the quality of professional preparation students receive at universities. Key concerns are students' lack of problem solving and critical thinking skills. Content coverage often is the primary criterion for success in professional education programs (Kennedy, 1990), but students are criticized for being unable to transfer content knowledge to real situations (Kennedy, 1990; Feltovich, Spiro, & Coulson, 1989).

In an effort to give students more experience with real situations, many professional schools use case studies in their courses. Originating in law schools during the late 19th century, case-based instruction has been adapted in many disciplines, including business, medicine, and teacher education. Educators in these disciplines began using cases to give their students a more field-based, realistic education. Frustrated by the abstractness of lectures and the inconsistencies of apprenticeship (let alone the logistical difficulties), educators turned to actual court rulings, business interviews, patient transcripts, etc. to help bring into the classroom the environments for which they were training their students. In case-based instruction, students read case studies taken from actual events, analyze those events, hypothesize about problems in the case, and recommend alternative solutions. Students engage in a dialogue with their professors about cases rather than merely taking notes about what professors espouse in lectures.

There are several benefits often associated with learning via cases. Cases put information in a realistic context for students. By contextualizing information, students can examine and compare situations and come to a better understanding of the information. Because cases represent real events, the concepts and skills learned in analyzing cases are more easily transferable to the real world than those learned abstractly. Cases also tend to promote higher levels of learning such as analysis, evaluation and problem solving. Furthermore, case-based instruction can be helpful in bridging the gap between theory and practice, promoting higher-level objectives, and motivating students (e.g., Christensen, 1987; Barrows, 1985).

Despite the oft-cited benefits of case-based instruction and its widespread use, criticisms of professional education still abound. Some educators have become frustrated with traditional cases because they typically simplify situations, lack richness of detail, and are written to illustrate one particular point. While cases seem to do a good job of putting information in realistic contexts, they could be doing more to help students gain better, more integrated knowledge and skills and to help them transfer these to the working world. A possible solution is to create rich, complex cases — *case experiences* that immerse students in complex problems rather than *case studies* that merely require armchair analysis.

This paper will discuss the need for complex cases in higher education, particularly business education. Issues about designing, implementing, and learning from complex cases will be examined and an example of a complex case will be described.

The Case for Complex Cases

Many recent influences in educational psychology (e.g., Brown, Collins, & Duguid, 1989; Lave, 1988; Spiro, Coulson, Feltovich, & Anderson, 1988) call for the design of learning environments that are much more contextualized (i.e., situated), authentic, and apprenticeship-like. Case-based instruction is usually considered a move in this direction. Cases are often recommended as an instructional method that preserves the cognitive authenticity of learning tasks without the necessity of actually being in the field (e.g., Shulman, 1992). The term "case," however, is often used to refer to everything from a two-paragraph scenario at the end of a textbook chapter to an extensive history with detailed descriptions of events, decisions, and people. In business education, cases are based on public financial records, management interviews, direct observations, and corporate communications; however, the wealth of data from all these sources typically is filtered, distilled, and summarized then written up for students. What results is typically a 10 to 30 page narrative docum... that may also include organizational charts, tables of financial data, resumes, and/or corporate memos. Thus, typical "Harvard-style" cases (Harvard is the largest publisher of business cases) usually lack the complexities of real work situations. Such cases may not allow students an opportunity to develop appropriate problem-solving skills. While students may be able to deal with neatly packaged problems within a case, they are all too often unable to deal with similar problems in a dynamic workplace. Another weakness of many business cases is that they are written to illustrate a specific concept, such as leadership, marketing strategies, or ethics. In limiting their scope, these cases may not adequately help students to see the interrelationships of these concepts in the real world. In analyzing business cases, students usually approach them as having all the information needed and that all included information is pertinent. Cases may present puzzles, but students assume that all the pieces of the puzzles are there. Often, traditional cases don't require students to go beyond the information given or to integrate other resources into their case analyses. Another problem with the way cases are typically taught is that they are used in one class, discussed, and then rarely referred to again. Few connections are made across cases.

Based on our study and practice, we recommend the creation of cases that offer more experiential, integrated, and authentic opportunities for learning. We've called such cases "complex" cases, though they could also be called experiential cases, rich cases, enhanced cases, or case experiences. Complex cases are cases that present real issues and problems for analysis via real materials. The materials may include print, video, or other media. Complex cases use media to enable large numbers of students to participate in many of the cognitive activities involved in actual field experiences. In a complex case, critical information is embedded in an authentic context of documents, reports, memos, conversations, and other organizational artifacts. Putting information into neat categories — an approach that overguides students to a "correct" answer — is avoided. Thus, complex cases are more realistic and messy than traditional cases. While complex cases present layers of detailed information, they avoid intentionally including red-herrings, statements that lay open traps for particular lines of faulty thinking. In addition, complex cases pose problems that have many possible answers and that can be looked at from multiple viewpoints. Complex cases necessitate discussion and thus should be group activities.

Complex cases, in essence, compress real information and communication. They are most like field research in that to be successfully completed they require students to seek out information, determine the value of information given to them, and analyze and synthesize their knowledge with new information. In a typical field experience, however, students spend months gathering the types of company documents, memos, and interviews that are presented in a complex case. While presenting these within a complex case instead of field research causes students to lose practice in consulting with companies, many efficiencies are gained. It is difficult to provide field experiences for students on a regular basis or for large number of students. In addition, many students do not have adequate time and resources for a semester-long field project requiring travel and other expenses.

The goals of complex cases, much like the goals of professional education, are ambitious. The key cognitive goals of using complex cases are to provide opportunities for students to develop flexible structures of knowledge, transition from novice to expert, think more like professionals, acquire the skills and language of their field, and deal with ill-structured information.

As business students build the advanced knowledge required to become managers they must grapple with increasing conceptual complexity and ill-structuredness. In order to grapple with this successfully, instructional activities should foster cognitive flexibility (Spiro, Feltovich, Jacobson, & Coulson, 1991; Spiro & Jehng, 1990; Spiro, Coulson, Feltovich, & Anderson, 1988). Spiro defines cognitive flexibility as the ability to quickly restructure one's knowledge in response to radically changing situational demands (Spiro & Jehng, 1990). Cognitive flexibility is achieved through avoiding oversimplification, striving for interconnectedness of concepts, promoting multiple representations, and active learning.

Spiro et al. (1988, 1991) claim cognitive flexibility is particularly important in ill-structured domains, i.e., areas of knowledge that have concept- and case- complexity as well as across-case irregularity. They note that the more ill-structured the domain, the poorer the guidance for knowledge application that "top-down" structures will generally provide. Such structures lose their usefulness because of the great variability from case to case and the great variability in which the same concept is used across cases. This irregularity works against the use of knowledge structures that assume "routinizability" across cases. One of Spiro's major arguments is that one has to 'criss-cross' complex material in order to understand it — similar to the way one has to criss-cross a landscape in order to get familiar with it. By criss-crossing through cases and concepts, students establish many alternative paths to get from one part of their knowledge base to any other part. Useful knowledge must be learned, presented, and tried out in many ways.

Typical professional programs, particularly medical programs, have been criticized by Spiro et al. (Feltovich, Spiro & Coulson, 1989) for oversimplifying content, being too theoretical, decontextualizing concepts and principles, and heavily compartmentalizing the curriculum. Such tendencies are major reasons for the lack of transfer of knowledge from university settings to the field. That is not to say that all learning must take place in the field. Collins, Brown, and Newman (1988) introduced the notion of cognitive apprenticeship which states that the learning of knowledge and skills must be embedded in the social and functional context of their use. There is an emphasis on authentic cognitive processes more than authentic physical environments. Complex cases attempt to use these understandings to provide students with rich, authentic tasks.

Recent research on expert-novice distinctions suggest that the cognitive schemata of experts are more elaborate, more complex, more interconnected, and more easily accessible than those of novices (Leinhardt & Greeno, 1986; Chi, M., Feltovich, P., & Glaser, R. 1982). While expertise is developed through continued experience with a wide range of examples, case-based instruction can simulate some of this experience and provide problem-solving practice for students. It is intended that through complex cases students not only will increase their experience with new concepts and examples, but they will also increase their ability to see the interconnectedness of concepts and examples.

Automotive Armature: An Example of a Complex Case

In response to national criticisms of accounting education as well as research advocating more situated, integrative, and active learning environments, a professor at Indiana University's School of Business undertook the challenge of creating an authentic, rich case. The case is about a real manufacturing company, Automotive Armature (AA), that was experiencing a variety of financial difficulties and operational problems. The AA case was originally used as a field research experience for a class of 25 undergraduate students in an upper-level accounting class. In teams, the students analyzed AA's accounting system. They found the experience highly motivating and that working with an actual company made accounting concepts and business issues much more relevant for them. While on-site field research had many learning benefits, it posed logistical problems when the professor decided to integrate AA into a core course in managerial accounting for 250 MBA students. While this number of students could not be sent to the company, the company could, at least in part, be brought to them.

The AA case was designed with several learning and technology goals in mind. First, the case was intended to promote students' discovery of problems in a complex, realistic business environment. In designing the case, an attempt was made to create a learning environment that contextualized managerial accounting concepts and integrated traditionally compartmentalized business curricula (e.g., accounting, marketing, operations). Unlike most Harvard-style cases, the AA case did not present information in a distilled, neatly organized manner. It was essential that this case lead students to experience the process of identifying important information, organizing it, and analyzing it, rather than having the case's organization, structure, or brevity do it for them. The students' task of determining key AA problems and recommending solutions was designed to be highly authentic.

On the technology side, the AA case had to provide textual, numerical, and visual data for students and it had to be "implementable." Forty groups would be working with the case, so the technology had to be available, accessible, and require minimal training. For Spring 1993, the AA case resources provided to the MBA students consisted of the following:

- 25-minute overview video of the company
- Eight 10- to 20-minute video interviews with the Chief Financial Officer (CFO)
- A 140-page document with company and industry data
- A live, one-hour Q&A session with the CFO
- The two class professors who served as case mentors
- A case consultant (an accounting MBA student) who served as a resource person for the case

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To give students a good sense of the company, it was important to show them what the company looked like, how its products were produced, what the working conditions were, etc. An overview video was produced to do this. The interview videos gave students more detailed information about different aspects of the company as well as role-modeled effective interviewing techniques for them. The print documents provided students with real company information via spreadsheet printouts, plant diagrams, newspaper articles, organizational charts, interoffice memos, reports, and other artifacts.

In their regular classes of 65 students, the MBAs were introduced to the case by one of the professors. It was stressed to them that this case was intended to help them build their critical and creative thinking, communication, and problem solving skills as well as to help them better understand the role of managerial accounting in conjunction with other company functions. Their task, as explained to them by the professor, was to sort through the information presented in the case resources, identify four or five of the company's key problems, and recommend solutions that would be feasible for the company within a 6-12 month time frame. Their task was situated in the context of a consulting engagement in which students directed their recommendations to the company's Chief Financial Officer.

This was a team project in which students, in groups of five or six, had about 10 days to go through the case materials, determine their recommendations, and write a 12-page (plus appendices) group paper. While the members of each team shared a copy of the videotape, everyone purchased their own copy of the 140-page case document. Each team began the case by watching the AA videos together, usually at a team member's home, discussing the videos, mapping out an initial strategy for determining recommendations, and assigning individual responsibilities.

Most teams chose to assign tasks on the basis of members' expertise (e.g., "the finance guy" was assigned to focus on the company's financial issues, the marketing major on marketing issues, etc.). Throughout the next stage of information gathering and organizing the students worked individually and in groups, regularly putting forth ideas and questions, discussing them, and refining them. The final stage of their task was to pull their ideas together and write a cohesive, concise paper. In their group papers, students were required to include not only recommendations, but justifications and to write in a business format, meaning that brevity, clarity, and persuasiveness were key.

Student and Professor Reactions to the AA Case

A variety of data has been collected to document the AA case activity and reactions to it, including class and team observations, surveys, and interviews. Overall, both students and faculty felt that the AA case provided a useful, authentic experience that allowed students to develop their analytical skills.

In a survey after the AA case was completed (N=187), most students indicated that the case was a valuable learning experience (75%) and that it would be worthwhile to do more cases like it (70%). Eighty-five per cent of the responding students, most of whom had business experience, thought that the AA case realistically portrayed a business situation and that this case was more interesting than the Harvard-type cases they had done (61%). They also thought that it was more demanding than Harvard-type cases (82%). While 41% of the students indicated that they were overwhelmed by the amount of information in the AA case, most students (72%) said they were able to make sense of the information. The

largest group of students (41%) reported that they spent 21 to 30 hours working on the case, while 23% reported 11-20 hours and 17% reported 31-40 hours.

The students reacted favorably to the videos and appreciated being able to see the company and its facilities. Many students thought the interviews were boring, although they acknowledged that they contained some valuable information. Some students were frustrated with having a large amount of seemingly disorganized data dropped in their laps. They wanted more context for some of the documents in the written materials, e.g., where they came from, why a consultant might request such a document, etc. Given the time pressure of the case, most teams worked in "survival mode." They divvied up tasks and focused on getting the required paper completed. There was not a great deal of time for reflecting on different perspectives, revisiting concepts, or revising their papers. From our group observations it was evident that a variety of problem-solving strategies were used. Students worked in their teams to figure out what information was most relevant, what information was missing, how they might get access to missing information, and how they could cross-validate different sources of information. Most teams ran additional calculations of financial data to project the impact of their recommendations. Some groups even consulted with sources such as a city chamber of commerce and an accounting firm to gather additional information.

The professors were generally pleased with the results of the AA case, though they had a variety of suggestions about how to do things differently the next time. Two primary suggestions were to allow more time for the case and to put it later in the semester after the concept of activity-based costing had been discussed. They felt that the students' papers were good, especially given the time constraints, though only a few were truly innovative. They noted that there wasn't a wide range in the teams' recommendations, with the key AA problems discussed in most papers being product proliferation, overly liberal core and warranty policies, poor inventory tracking, lack of product costing, and excessive inventory. While some of the recommendations were interrelated, most papers broke down recommendations into production, marketing, accounting, systems, or transportation issues. One professor commented that several papers failed to cover basic issues, such as cash flow. While these papers may have discussed related issues, they failed to adequately tie the issues together.

DesignIssues concerning Complex Cases

Cases, in general, are considered useful instructional activities for the development of higher level skills. Complex cases — case experiences as opposed to a case studies — may be most appropriate when advanced problem-solving skills, expert level of performance, and integration of concepts are desired. But how does one design a complex case? When creating rich learning environments for students, case developers (in our project, a team of instructional designers and subject matter experts) are confronted with several challenges. What should be included in the case? What should be excluded? How should it be presented? What should students be asked to do with the case? How much guidance should they be given? How will students' learning be evaluated? Three major dynamics should be considered when designing a complex case: authenticity, organization and duration (see Figure 1).

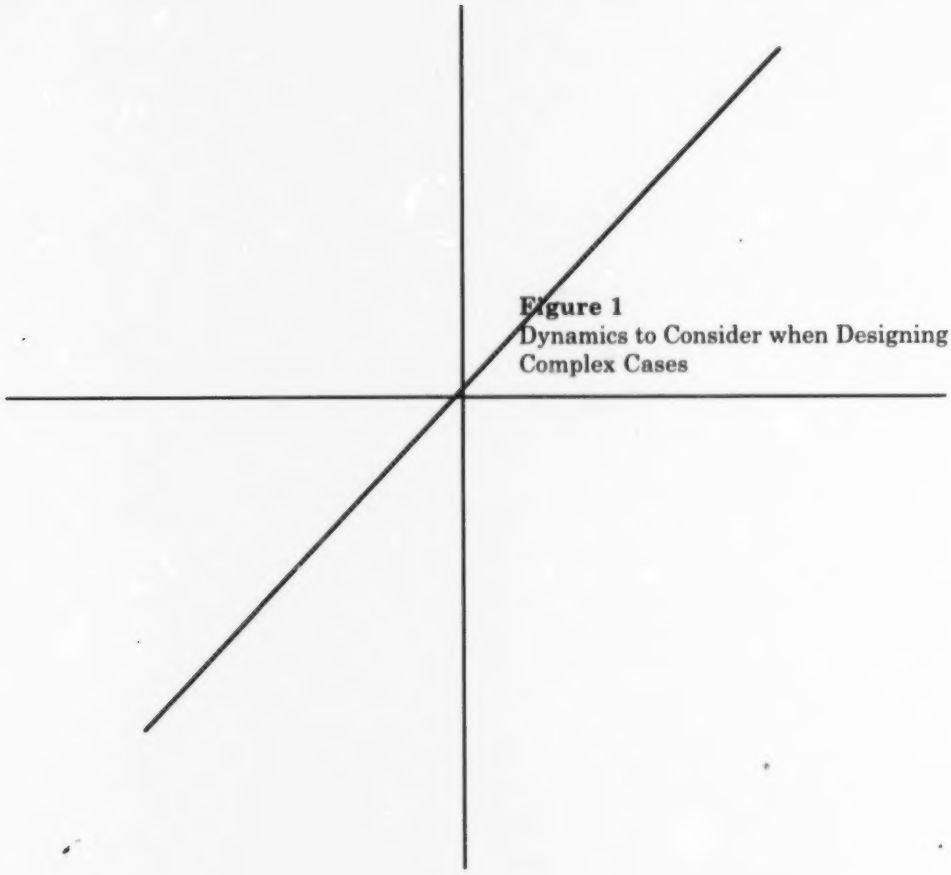

Figure 1
Dynamics to Consider when Designing Complex Cases

Authenticity

A high degree of authenticity is essential in a complex case, both in the case materials and in the case task. This can be achieved by creating tasks for students that are as close to field experiences as possible rather than fabricated experiences. Developers should use real situations for their cases not fictitious ones, raw data as opposed to narratives, and actual documents more than summaries. In order to create a case that is demanding and engrossing, case developers must put students in the middle of dynamic, multifaceted scenarios that reflect the natural complexities of the real world.

Multiple sources of information are required to develop a complex case. To get the authenticity and richness desired in a complex case, case developers need to work directly with the entity that is the subject of the case, e.g., a company, agency, school, hospital, group, etc. That organization must provide a good portion of the case information and be willing to allow developers to sift through organizational documents and communications. The amount and quality of the data gathered is greatly dependent on who the key contact is with the organization. Additional information for complex cases may come from professional

reports, newspaper or magazine articles, research databases, or interviews with company clients or competitors. In the AA case, access to the company grew out of a consulting engagement that a professor had with the company. Since the company was only 45 minutes away from the university, it was feasible to make on-site visits to meet with company personnel, shoot video of the plant, and attend company meetings. Having close proximity to the case source is not only beneficial for these reasons, but for motivating and involving students as well. In the AA case, knowing that the company was nearby helped increase the realism and relevance of the case.

In designing a complex case, students must be positioned as active participants in the case, not passive readers. Accordingly, the usual narrative style of most cases that creates a linear story must be substantially replaced by authentic documents. As much as possible, the language of the field should be used. Thus, spreadsheets and financial reports were used in the AA case. Children's drawings or test norms might be used in a psychodiagnostic case or blue prints and building models in an architecture case.

Case developers must also determine how the case will be presented to students. Typically, cases are paper-based. This is economical and easily distributed. In a complex case there is an effort to create a rich environment that has as high a fidelity with reality as possible. Thus, the use of video is recommended to bring the field environment into the classroom environment. Video adds another level of richness to the data students must work with in analyzing a case. Via video students can see a company's facilities, personnel, working conditions, and products. The use of video in the AA case was seen as important because it would allow students, like consultants in the field, to learn about the company through casual visual information, e.g., dirtiness of used parts, disorganization of barrels, mannerisms of management, etc.

Organization

Even a rich, complex case must have some sort of organization. The act of capturing a piece of reality and presenting it to students unavoidably involves structuring that reality. Case developers must determine the kind and amount of structure to give the case, yet at the same time avoid imposing undue analysis or interpretation to the materials. A flexible organization maximizes the students' challenge to determine their own organization and priorities for the case. An organization that is too structured tends to turn information into answers and, therefore, is less challenging and less authentic. Many organizing schemes are possible: chronological, alphabetical, hierarchical, functional, or topical. Usually it is best to choose a scheme that is authentic to the case environment. For example, in the AA case we organized the video interviews and print materials around the typical functions of a business; accounting/finance, management, production, marketing, and human resources.

The next organizational challenge is to determine the boundaries of the case; what to include, exclude, summarize, etc. If one decided to "include everything" a complex case would be huge to the point of being unmanageable. While a complex case should have broad rather than narrow boundaries, case developers have to make some decisions about what to leave out. Several factors guide such decisions. First of all, what is the level of the learners? Freshmen may be less able to deal with masses of unstructured, detailed information than graduate students. The less advanced learners are, the more developers should consider summarizing lengthy documents, omitting tangential materials, limiting the number of issues in a case and/or allowing more time for students to work with the case. More important than the case materials themselves, however, is the level of challenge in the

students' task for the case activity. A complex case, including the data set from which it is derived, may be usable across a variety of student levels provided the learning goals are put at an appropriate level. When determining the organization of a complex case the boundaries shouldn't be limited to a particular area, for example in the business field to just management, operations, or marketing. While a complex case might be used in one particular class, it should include perspectives, issues and data from other "classes," i.e., areas or related perspectives, to give it realistic richness.

Duration

A third dynamic to consider when designing complex cases is duration, both in terms of the amount of time covered about the organization described in the case and the amount of time that students are intended to work on the case project. The time period described in a case could be a week or a decade as long as that time period contains enough rich information to engage students in a variety of issues. In the AA case we provided some general historical information about AA, but primarily concentrated on the company's most recent fiscal year (a typical framework for a business analysis). Originally, we'd intended that the AA case be used throughout the semester, but a variety of curriculum logistics prevented that. The students ended up spending approximately 10 days on the AA case which was later considered too short a period of time to achieve all the goals of the case activity. Complex cases are time consuming. Time must be allowed for students to visit and revisit the many different case resources, to "criss-cross the landscape."

Learning Issues concerning Complex Cases

Complex cases place a high learning demand on students, more so than with traditional cases. Three of the key challenges that students face are dealing with information overload, coping with a high level of ambiguity, and integrating information from multiple perspectives.

Dealing with Information Overload

When presented with lots of "raw data," most students are initially overwhelmed. "Where do I start?" and "How will I make sense of all this?" are typical questions running through their heads. From a learning perspective, students must find ways to organize the data in meaningful ways. We recommend that students start in groups, scanning the case documents and other materials and making some initial hypotheses about important issues or problems. What was once a mass of data now becomes data that is focused by specific problems. With a problem-based focus, students can more effectively sort useful from the less-useful information that is presented in a complex case. Depending on their problem focus, one student's information may be another student's non-information. As students read or view case materials, they examine the materials in light of problems and hypotheses about their solutions. It is essential that students discuss their hypotheses with others as they delve further into the case to both deal with information overload and to check their hypotheses. Through this discussion new hypotheses may emerge. The abundance of information in a complex case can also be managed by asking questions. The professor or case consultant can be useful resources in helping students pose and focus effective questions.

Coping with a High Level of Ambiguity

A complex case presents a scenario (or multiple scenarios) that does not lead students to a predetermined end. Students can take a complex case in many directions. Their task is somewhat ambiguous and lacks a precise algorithm to follow. When students are asked to solve problems in more traditional cases, they know the problems are within the boundaries of the case and more often than not focused on that week's topic in class. The danger in this is that the case may be no more than an illustration of a problem rather than a challenging intellectual activity. In a complex case the students' task is one of problem finding as well as problem solving. Ambiguity is a necessary component of a complex case because it is frequently a difficult aspect of professional work as well. Students have to struggle with the ambiguity in order to reach the higher learning goals. While this struggle is necessary, it may be appropriate to help students anticipate this struggle and acknowledge the difficulties of dealing with ambiguity. The tasks involved in a complex case activity may be very different from the activities in students' other classes so coaching students in new ways of working may be necessary.

Integrating Information from Multiple Perspectives

As students read a complex case, they gather and organize information from a variety of sources. As active participants in the case, students choose to go down many different paths that they may also choose to cross and re-cross. The students' challenges are to identify and assess different perspectives and to integrate them in order to make effective recommendations. The materials in a complex case should give students many opportunities to examine the same information repeatedly from different perspectives. To help students integrate information from multiple perspectives, they must be given opportunities to discuss these perspectives. Such discussion should include "what if" or devil's-advocate style questions to deepen students' understanding of different perspectives. In addition, it is helpful to integrate concepts from a complex case into other discussions. In the AA case this occurred both naturally and intentionally. The MBA students often brought up Automotive Armature as an example in class discussions after the case activity. The class professors also used the AA case again at the end of the semester for an activity-based costing assignment.

Implementation Issues concerning Complex Cases

Many issues must be considered and addressed when implementing complex cases. Three of the most important will be discussed here. The first revolves around the concept of appropriation, i.e., the process by which the design and the product are actually used by the professor and the students. The second implementation issue is how the complex case fits within the larger educational environment. A third major issue concerns the instructor's perspective on teaching.

Appropriation

Complex cases are intentionally designed to have a great deal of flexibility. This flexibility promotes appropriation. Case developers should be willing to allow users to assimilate the case materials and activities into their current ways of doing things, even if this means changing them from their original intent. All instructional products are appropriated in some way by the end users. For example, group work may actually be done

by individuals outside of class; a case designed for a month may last a week; information designed for random computer access may be printed out and read. This actual use is fundamentally outside of the control of the designers. One of the traditional complaints within instructional design is that the designs are excellent but they are never "correctly" implemented. This frustration has led to the notions of getting rid of the teacher and that delivery through technology alone is preferable. But appropriation is a natural, and not necessarily negative, process. By observing how professors and students appropriate complex cases, developers can gain insight about how to improve the case materials and activities and how to build tools that capitalize on their natural use.

Fit

The second major issue in implementing complex cases involves how the case fits within the overall educational environment. How a case fits in with the rest of students' curriculum and educational demands affects the implementation. Complex cases should be related to at least other topics within the course if not multiple courses in a curriculum. They should not be seen as disconnected activities that have nothing to do with other things students are learning. Complex cases require group work. Teams may or may not be a part of the educational culture. If not, steps should be taken to introduce students to this way of working and to provide extra support for this during the case activity. Complex cases are very time demanding, so they should be scheduled at a time when students have fewer demands in their other classes or they should be scheduled for incremental use over a longer period of time. In the AA case activity, it turned out that some student teams had major presentations in another course and many students were worried about their upcoming mid-terms. Thus, some students did not devote sufficient time to the AA case activity and allowed their fellow team members to pick up the slack.

Instructor's Perspectives

A third major issue in implementing complex cases is the instructor's perspective on teaching in terms of having any one "right" answer to the case. Complex cases are considered to have a wide array of possible right answers. The amount of information and context is broad enough to allow for a large number of perspectives to be brought out as key concepts. This should allow for the possibility of the case being reused frequently with a change of student goal. If, however, the general attitude of students, professors, or the program in general is that cases have singular correct answers or are about single issues, the complex case may not be used frequently enough to be cost-effective. It's important that the case be designed flexibly enough that it not focus on a single issue. This way, the case provides sufficient information and context so that the activity can be substantively different each semester by changing the basic question. In this project, the same case materials were utilized twice in the semester by changing the focus of the problem and adding a limited amount of additional case materials.

A related issue with complex cases is the instructor's perspective on teaching in terms of being an authority. He or she must be willing to accept a teaching role that is one of a guide rather than a director. With complex cases, the instructor must hold back and allow students to find their own answers rather than telling them possible answers. It is important for the expert — whether that's the professor, the company visitor or the advanced student — to be careful of revealing too much to the students and to provide a framework that stimulates students to find things out for themselves.

Some Caveats for creating Electronic or Multimedia Complex Cases

A major point for implementing complex cases is to realize that they are not just for individuals. A common problem of utilizing an electronic or multimedia format requiring computers is that many people still see computers primarily for individual activity. Computer laboratories are set up with individual workstations. People have individual and personalized laptop or desktop computers. More often than not, converting learning materials into a computer format may itself contribute to a breakdown of team cooperation in the analysis and problem solving of rich cases.

Our recommendation is for a specific component designed to start the team discussion. In the AA case, the video — which early in the design phase was seen as reference material — ended up as a vehicle for interaction of the student team members. Each team received a videotape and they were encouraged to watch it the first time together. Certainly, a multimedia version of the case with random access to the video at a later time could be useful to students. However, the video as a social vehicle for examining the case and discussion case issues was probably more valuable.

Another major point of design in a complex case is to make sure that the materials are readily accessible. Here again, we confront the dilemma that turning a case into an electronic format may make it less accessible, not more so. In the AA case, a thick stack of 3-hole punched papers were the print materials provided to all students. Students put these papers in binders where they could write on the documents, rearrange them, highlight them or index them. If we had put the AA case into a computer format it would have required a high-end desktop computer which would not have been broadly available either at the university or by the students at home. Several stations in the MBA computer lab could have had the AA case on them, but this would not have been enough access for 250 students. Without appropriate accessibility, an electronic format may discourage people from the type of reading, review and reflection of the materials necessary for the problem-solving nature of the activity.

Conclusions

There are few examples of what we have been calling complex cases. More instructional activities based on complex cases need to be developed and researched to gain a clearer understanding of of their potential and optimal uses. As an example of a complex case, the Automotive Armature case had mixed success. While the students and professors found it more valuable than traditional cases, there were still problems with students compartmentalizing concepts and not integrating their recommendations. However, we still feel that complex cases are a step in the right direction in getting students to develop flexible structures of knowledge. One complex case alone cannot be expected to create an expert. It is a slow and difficult process to develop knowledge and skills in ill-structured domains (Spiro & Jehng, 1990). Students may well benefit from a series of experiences — in the field when possible and through complex cases when not — that allow for exploration and learning without compromising the fundamental complexity of ill-structured domains within professional disciplines.

References

Albright, R.J., & Albright, L.G. (1981). Developing professional qualities in engineering students. *Engineering Education*, 71, 677-679.

Association of American Colleges, (1984). *Physicians for the twenty-first century* (Report of the project panel on the General Professional Education of the Physician and College Preparation in Medicine). Washington, DC: Author.

Barrows, H.S. (1985). *How to design a problem-based curriculum for the preclinical years.* New York: Springer.

Brown, J.S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, v18, p.32-42.

Chi, M., Feltovich, P., & Glaser, R. (1982). Catergorization in experts and novices in R. Sternberg (Ed.), *The Handbook of Intelligence.* Hillstale, NJ: Erlbaum.

Christensen, C.R. (1987). *Teaching and the case method.* Boston: Harvard Business School.

Collins, A., Brown, J. S., & Newman, S. E. (1988). Cognitive apprenticeship: Teaching the craft of reading, writing, and mathematics. In L. B. Resnick, (Ed.). *Cognition and Instruction: Issues and Agendas.* Hillsdale, NJ: Erlbaum.

Feltovich, P.J., Spiro, R.J., & Coulson, R.L. (1989). The nature of conceptual understanding in biomedicine: The deep structure of complex ideas and the development of misconceptions. In D. Evans & V. Pate (Eds.), *The cognitive science in medicine.* Cambridge, MA: MIT Press.

Kennedy, M.M. (1990). Choosing a goal for professional education. In Houston, W.R., *Handbook of research on teacher education.* New York: Macmillan.

Lave, J. (1988). *Cognition in practice.* New York: Cambridge Press.

Lienhardt, G. & Greeno, J.C. (1986). The cognitive skill of teaching. *Journal of Educational Psychology*, 78, p. 75-95.

Mason, J.C. (1992). Business schools: Striving to meet customer demand. *Management Review*, 81(9), Sept. 1992, p. 10-14.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15(2),* 4-14.

Shulman, L.S. (1992). Towards a pedagogy of cases. In J. Shulman (Ed.), *Case methods in teacher education.* New York: Teachers College Press.

Spiro, R.J., Coulson, R.L., Feltovich, P.J., & Anderson, D.K. (1988). Cognitive flexibility theory: Advanced knowledge acquisition in ill-structured domains. In *the Tenth Annual Conference of the Cognitive Science Society.* Hillsdale, NJ: Erlbaum.

Spiro, R.J. & Jehng, J. (1990). Cognitive flexibility and hypertext: Theory and technology for

the nonlinear and multidimentional traversal of complex subject matter. In D Nix & R. Spiro (Eds.), *Cognition, Education and Multimedia*. Hillsdale, NJ: Erlbaum.

Spiro, R.J., Feltovich, P.J., Jacobson, M.J., & Coulson, R. L. (1991). Cognitive flexibility, constructivism, and hypertext: Random access instruction for advanced knowledge acquisition in ill-structured domains. *Educational Technology*, 21(5), 24-33.